

**LOCAL JOINT HEALTH AND SAFETY COMMITTEE
DEPARTMENT OF BIOMEDICAL SCIENCES
STANDARD OPERATING PROCEDURE**

1. MANAGEMENT OF FLAMMABLE SOLVENTS

Effective Date: August 1, 2002

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Purpose: To promote the safe use and storage of flammable solvents.

Approvals Required: Faculty Supervisor, Local JHSC, EHS

2. DEFINITIONS:

Flash Point: The minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Flammable Liquid (Class I): Liquid with a flash point of less than 37.8C (eg. acetone, ethanol, toluene, hexane, carbon disulphide, gasoline, camp stove fuel).

Combustible Liquids (Class II and III): Liquid with a flash point of more than 37.8C but less than 93.3C (eg. aniline, acetic acid, mineral spirits, motor oil).

Fire Compartment: A laboratory **or suite of laboratories** whose walls have been constructed with a one-hour fire rating.

Approved Safety Container: A metal or plastic container that conforms to the Underwriters Laboratories of Canada, Standard ORD-C30, 1995. N B.: 20/25 L metal drum shipping containers are **not** approved storage safety containers.

Bonding: Term for eliminating the difference in electrical potential between two or more objects; accomplished by attaching a conductive wire between the objects to allow the free flow of charge.

Grounding: Term for providing the means for continuously discharging a charged conducting body to earth.

3. REQUIREMENTS:

Applicable Legislation: Occupational Health and Safety Act (OHSA), R.S.O. 1990, Sects. 25-28, 36-38 and 42 Ontario Regulations 860, R. R. O 1990, - WHMIS
The Ontario Fire Code (Ontario Regulations 388/97, Part IV
Transport of Dangerous Goods Act and Regulations, R. R. O. 1990

Relevant Standards:

Ministry of Labour, Engineering Data Sheet No 4-01 - *Storing and Dispensing of Flammable Liquids*, 1997

Refrigeration Equipment, CSA Standard CAN/CSA-C22.2 No. 120-M91

Safety Containers, Underwriters' Laboratories of Canada, Standard UCL/ORD-C30, 1995

Storage Cabinets for Containers of Flammable Solvents, Underwriters' Laboratories of Canada, Standard UCL/ORD-C 1275, 1984

Internal Requirements:

[UofG Laboratory Safety Manual 2016](#)

Important Information From The Ontario Fire Code:

- a) Keep quantities of flammable and combustible liquids to a minimum.
- b) Do not store or use more than 5 litres of flammable or combustible solvents in basements.

- c) Do not store more than a total of 300 litres of flammable and combustible liquids in a fire compartment. Of this 300 litres, only 50 litres may be flammable solvents
- d) The quantity limits in c) must include any flammable and combustible wastes generated in the laboratory.
- e) Solvent waste containers shall be clearly identified with a WHMIS label or tag. ***In the Department of Biomedical Sciences, the capacity of solvent waste containers shall not exceed 5 litres.***
- f) One solvent cabinet is recommended per fire compartment.
- g) More than one solvent cabinet may be permitted per fire compartment only when the installation is approved by the Campus Fire Prevention authority and the laboratory limits are not exceeded.
- h) No more than 10 litres of flammable or combustible liquids may be stored outside of the storage cabinet. Of the 10 litres, not more than 5 litres may be flammable liquids.
- i) Containers larger than 5 litres must be approved safety containers. ***In the Department of Biomedical Sciences, containers larger than 5 litres shall be stored only in the Flammable Storage Vault beside the clinical research building.***
- j) If the purity of a liquid would be compromised by storage in an approved safety container, glass containers smaller than 5 litres shall be permitted.
- k) Containers for flammable and combustible liquids shall be labelled to indicate the content and shall show WHMIS markings and owner identification. ***In the Department of, the size of containers of flammable solvents purchased for storage in laboratories shall not exceed 5 litres.***
- l) Containers shall be kept closed when not in use.
- m) Refrigerators/freezers for storage of flammable liquids must conform with the CSA 22.1 standard (see above); quantities stored in refrigerators/freezers shall be included in the laboratory limits.
- n) Storage of flammable solvents and other hazardous materials in fumehoods beyond that required for daily research operations is prohibited, and shall not exceed 5 litres.
- o) Electrical equipment, such as blenders or stirring motors, used in fumehoods where flammable liquids are handled must be CSA approved (i.e. spark proof) for hazardous locations.

4. DESCRIPTION OF THE TASK:

Wear a cotton or fire retardant labcoat as the basic personal protective item of clothing when handling flammable solvents or combustible liquids.

- a) **Purchasing Flammable and Combustible Solvents:** Purchase flammable and combustible solvents in plastic, metal or safety-coated glass containers in the smallest sized volumes practical for doing the job.
- b) **Receiving Flammable and Combustible Solvents:** Unpack flammable and combustible liquids immediately on receipt, identifying each container with date of receipt and owner's name. Store containers in a CAS approved flammable storage cabinet to the maximum allowable volume of 50 litres for flammable solvents. **NB.** This is inclusive of flammable waste and solvent samples stored in flammable proof refrigerators and freezers. Record purchases in HAZCHEM as a new record - copying an existing record for the chemical, but with the new date and volume will suffice. Update or delete the old record. Volumes in excess of 50 litres should be removed to the Flammable Solvent Vault and

maintained on a separate HAZCHEMWEB Inventory for that building. **Where there is no flammable storage cabinet**, flammable solvent volumes stored in the laboratory shall be restricted to a maximum of 5 litres. File new **Material Safety Data Sheets** in the laboratory Safety Binder or update existing MSDSs if they are beyond their 3 year validity.

- c) **Decanting Flammable and Combustible Solvents:** Before using any flammable and combustible chemical for the first time, read the MSDS to determine the toxicity and health hazards associated with the product. Also determine what **Personal Protective Equipment**, in addition to a labcoat, needs to be used, eg. gloves, safety glasses. **Uncap, dispense, mix, dilute and recap flammable and combustible chemicals only in a fumehood.** *NB. Refer to the SOP for the Safe Use of Fumehoods.* The size of the solvent container decanted from should be no more than 5 litres. **It is inappropriate and dangerous to attempt to decant from 10 or 20 litre safety cans in a fumehood, or worse still, on the laboratory bench or floor, especially when bonding and grounding cables are required.** Dispensing flammable solvents from containers larger than 5 litres should be done in the Flammable Storage Vault, which is equipped with cables for bonding and grounding containers and a Halon Gas Extinguisher System.
- d) **Labelling Dispensed Flammable Solvents:** As with any hazardous chemical transferred from its original container, the product shall be identified with a WHMIS label stating the concentration, hazard category and other precautionary information.
- e) **Using Flammable Solvents:** Flammable solvents shall be used only in a fumehood in volumes adequate for daily use, the quantity not exceeding 5 litres at a time. Solvents shall be returned to the Flammable Storage Cabinet after use or at the end of the work day. Overnight storage of flammable solvents in the fumehood is inappropriate. **Use and storage of open sources of flammable solvents on a laboratory bench or shelf is prohibited.**

5. CONTINGENCY PLAN AND REPORTING:

Although good laboratory practices for the management of flammable and combustible solvents are a prerequisite for prevention of spills, knowing how to deal with spills is equally important, **and the procedure for doing so is a requirement of law.** The University of Guelph Environmental Health and Safety Bulletin, Vol. V No 3, October 1996 stated that laboratory personnel are responsible for cleaning “small” chemical spills of < 5 litres. Using the adage that a little goes a long way, and that each flammable solvent has a different flash point and differing toxic or health properties, the degree of spill management is thus dependant on the volume of a particular solvent which has been spilled. Five litres spilled in a laboratory is a lot. The **Ontario Fire Code**, Part 4, section 4.1.6, addresses the issue of spill control procedure. The OFC states “A written spill control procedure shall be produced and posted in a visible location for any occupancy where flammable or combustible liquids are handled, processed, stored, dispensed or used.” The written procedure should consider:

- a) control of ignition sources
- b) spill containment, clean-up, and waste disposal instructions
- c) personal protective clothing and equipment necessary for spill clean-up
- d) notification to laboratory and supervisory personnel, and to **Environmental Health and Safety**
- e) spill mitigation orientation for laboratory personnel every six months.

A written procedure for dealing with flammable solvent spills is found below. Post it adjacent to the flammable storage cabinet or spill kit.

FLAMMABLE SOLVENT SPILL MANAGEMENT

- **Spills In The Fumehood**

- **Minor spills** of a few to 50 mL should be absorbed onto paper towels or tissues and allowed to evaporate to dryness in the fumehood with a hood sash opening of around 10 cm. No other action should be required.

- **Medium spills** of between 50 mL and 500 mL should be contained on the surface of the fumehood with the **absorbent mats** which are at the spill kit station. In the likelihood that a spill of 400-500 mL overflows the lip around the surface of the fumehood, fast action to tide this flow is required. This may mean using more than one absorbent mat, so it is essential to have a stock of these mats as part of the spill kit. A labcoat splashed with solvent should be removed and placed in the fumehood to one side of the spill. Quickly put on another labcoat.

- **Larger spills** of up to one litre require, in addition to absorbent mats, the use of **SOLVENT SPILL HANDLER**. Spread Solvent Handler initially around the spill, then over the absorbent mats. The Solvent Handler acts to absorb and neutralize the solvent.

- Once the Solvent Handler has caked and dried, clean up the fumehood and floor, and dispose of the debris in the garbage.

- **Spills on the Laboratory Floor**

Spills on the laboratory floor of >500 ml to 5 litres require quick thinking and quick action.

- Either vacate the laboratory immediately and phone ext. 2000 for assistance. Do not re-enter the laboratory.

OR continue as follows.

- Control of Ignition Sources:

If your lab is equipped with an electrical power kill switch that cuts electricity to all sockets, trip the switch (usually located near the main exit).

- If your lab is not supplied with an electrical kill switch, you cannot safely control ignition sources. Do not go around the lab pulling plugs.

- **Spill Containment**

- Place all available absorbent mats, pillows and cushions on and around the spill to prevent it spreading.

- Open the bottle of SOLVENT SPILL HANDLER and pour the contents (activated charcoal) initially around the periphery of the spill, then over the spill in a ratio of 2 parts SOLVENT SPILL HANDLER to 1 part spill volume.

- Vacate the lab (post a sign - SPILL - DO NOT ENTER) and allow time for the solvent handler to neutralize the spill, absorb odours and dry to a cake.

- **Personal Protective Clothing and Equipment Necessary for Spill Clean-Up**

Wear a lab coat, heavy duty rubber gloves, safety glasses, a surgical face mask and stout shoes or rubber boots.

- **Clean-Up and Waste Disposal**

- Place the used absorbent pads, socks and pillows and caked solvent handler in a garbage bag, if necessary using a paint scraper if the pads have annealed to the floor and a dust pan and brush for loose charcoal. Place glass from the broken solvent bottle in the bypass stream. Damp mop the floor.

- Place the garbage bag in the regular or bypass waste stream.

- **Notification to Laboratory and Supervisory Personnel, and to Environmental Health and Safety**
 - Do not allow occupation of the lab until solvent fumes have dissipated and clean-up has been completed. Inform your immediate supervisor of the incident and fill out an Injury/Incident Report Form which is sent to EHS.
 - **Spill Mitigation Orientation**
 - Identify how and why spill happened.
 - Identify how to prevent reoccurrence of spills
 - Identify changes in solvent purchase and storage practices.
- 6. WASTE MANAGEMENT AND ENVIRONMENTAL RESPONSIBILITY:**
- **Flushing waste solvent down the sink is prohibited!**
 - Waste solvent must be segregated into two main streams: 1) Nonhalogenated (e.g. acetone, ethanol, methanol, xylene, hexane) and 2) Halogenated (e.g. chloroform, acetyl chloride and bromide, benzyl chloride, chlorobenzene).
 - Waste solvent containers must be non-returnable, preferably safety coated glass bottles or metal cans of no more than **5 litres** capacity.
 - Waste containers must be identified with WHMIS labels giving correct relevant information for the solvent.
 - Waste solvent is part of the total solvent inventory of 50 litres for a lab with a CAS approved Solvent Storage Cabinet and should be stored in the cabinet. For a lab that does not have a CAS approved Solvent Storage Cabinets, the waste solvent volume is part of the allowable limit of 5 litres.
 - To identify percentages and names of mixed solvents, keep a log by date, volume and name for each addition of solvent to the waste container.
 - For disposal, fill out a '[Surplus Chemical and Sharps Disposal Request](#)' form, tag the items appropriately and send the form to EHS.
- 7. REFERENCES:**
WHMIS Regulations; Occupational Health and Safety Act; Ontario Fire Code, Part 4: Transport of Dangerous Goods Act; Underwriters' Laboratories of Canada; Solvent Spill Handler Directions
- 8. DISTRIBUTION OF COPIES:**
Technicians, Graduate Students, Project Students
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By: Faculty Supervisor